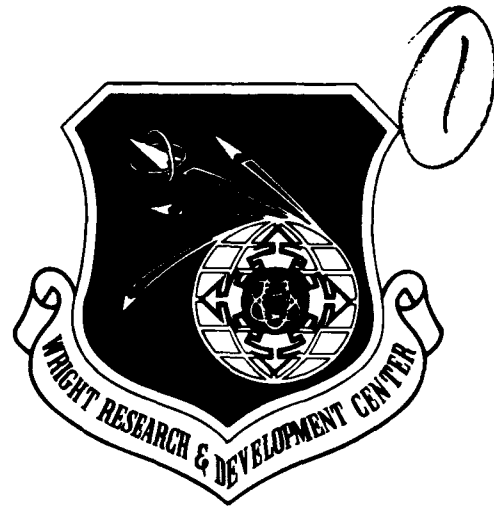


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Volume V  
Part 18

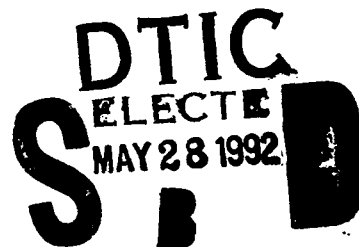
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INTEGRATED INFORMATION SUPPORT SYSTEM (IISS)  
Volume V - Common Data Model Subsystem  
Part 18 - Neutral Data Manipulation Language (NDML) Precompiler  
Generate Conceptual Schema to External Schema Transform Product  
Specification

M. Apicella, J. Slaton, B. Levi

Control Data Corporation  
Integration Technology Services  
2970 Presidential Drive  
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MANUFACTURING TECHNOLOGY DIRECTORATE  
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AIR FORCE SYSTEMS COMMAND  
WRIGHT-PATTERSON AIR FORCE BASE, OHIO 45433-6533

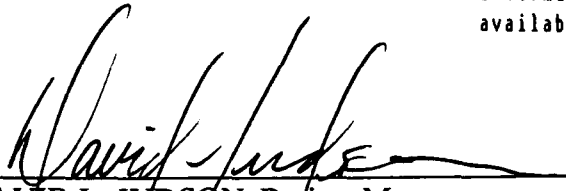
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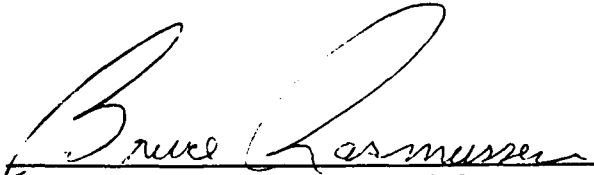
This technical report has been reviewed and is approved for publication.

This report is releasable to the National Technical Information Service (NTIS). At NTIS, it will be available to the general public, including foreign nations

  
DAVID L. JUDSON, Project Manager  
WRDC/MTI  
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25 July 91  
DATE

FOR THE COMMANDER:

  
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25 July 91  
DATE

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<p>This document establishes the design of Function PRE8, "Transform CS/ES", one of the major functions of the Configuration Item "Precompiler" to be built and formally accepted by the ICAM program office.</p> <p><b>BLOCK 11:</b></p> <p><b>INTEGRATED INFORMATION SUPPORT SYSTEM</b> Vol V - Common Data Model Subsystem</p> <p><b>Part 18 - Neutral Data Manipulation Language (NDML) Precompiler Generate Conceptual Schema to External Schema Transform Product Specification</b></p>				
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### FOREWORD

This technical report covers work performed under Air Force Contract F33600-87-C-0464, DAPro Project. This contract is sponsored by the Manufacturing Technology Directorate, Air Force Systems Command, Wright-Patterson Air Force Base, Ohio. It was administered under the technical direction of Mr. Bruce A. Rasmussen, Branch Chief, Integration Technology Division, Manufacturing Technology Directorate, through Mr. David L. Judson, Project Manager. The Prime Contractor was Integration Technology Services, Software Programs Division, of the Control Data Corporation, Dayton, Ohio, under the direction of Mr. W. A. Osborne. The DAPro Project Manager for Control Data Corporation was Mr. Jimmy P. Maxwell.

The DAPro project was created to continue the development, test, and demonstration of the Integrated Information Support System (IISS). The IISS technology work comprises enhancements to IISS software and the establishment and operation of IISS test bed hardware and communications for developers and users.

The following list names the Control Data Corporation subcontractors and their contributing activities:

<u>SUBCONTRACTOR</u>	<u>ROLE</u>
Control Data Corporation	Responsible for the overall Common Data Model design development and implementation, IISS integration and test, and technology transfer of IISS.
D. Appleton Company	Responsible for providing software information services for the Common Data Model and IDEF1X integration methodology.
ONTEK	Responsible for defining and testing a representative integrated system base in Artificial Intelligence techniques to establish fitness for use.
Simpact Corporation	Responsible for Communication development.
Structural Dynamics Research Corporation	Responsible for User Interfaces, Virtual Terminal Interface, and Network Transaction Manager design, development, implementation, and support.
Arizona State University	Responsible for test bed operations and support.

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## SECTION 1

### SCOPE

#### 1.1 Identification

This specification establishes the design of Function PRE8, "Transform CS/ES", one of the major functions of the Configuration Item "Precompiler" to be built and formally accepted by the ICAM Program Office. This CI constitutes one of the subsystems of the Common Data Model Processor (CDMP).

#### 1.2 Functional Summary

The purpose of this Computer Program Configuration Item (CPCI) is to generate source code which at runtime will transform the aggregated conceptual format results to the required external schema format.

The following function will be performed by this CPCI:

1. Generate a COBOL, FORTRAN, or C program.
2. Generate working storage to contain variables to perform the necessary arithmetic functions; namely, minimum maximum, count, sum, average or mean.
3. Generate files to perform the necessary "ORDER BY" and "DISTINCT" clauses.
4. Generate Procedure Division statements to move the conceptual format results to an external format variables.
5. Perform the user specified arithmetic function on the external schema results, and the sorting and sequencing necessary to produce the "ORDER BY" and "DISTINCT" results.



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Availability Codes	
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SECTION 2  
DOCUMENTS

2.1 Reference Documents

1. ICAM Documentation Standards: IDS15012000A, 28 December 1981.
2. D. Appleton Co., CDM Administrators Manual: UM620141000, March, 1984.
3. D. Appleton Co., CDM1-IDEF, Model of the Common Data Model: CCS620141000, 15 May, 1985.
4. D. Appleton Co., Computer Program Development Specification (DS) for ICAM Integrated Support System, (IISS) Configuration Item: NDML Precompiler: DS620141200, October, 1984.
5. D. Appleton Co., Embedded NDML Programmer's Reference Manual: PRM620141200, March, 1985.
6. Softech, Inc., NTM Programmer's Guide: UM620140001, July, 1984.
7. Control Data Corp., Computer Program Development Specification (DS) for ICAM Integrated Support System (IISS) Configuration Item: NDDL Command Processor: DS620141100, June 1985.

2.2 Terms and Abbreviations

Attribute Use Class: (AUC)

Conceptual Schema: (CS)

Common Data Model Processor: (CDMP)

Common Data Model: (CDM) Describes common data application process formats, form definitions, etc, of the IISS and includes conceptual schema, external, internal schemas, and schema transformation operators.

Data Field: (DF) An element of data in the external schema. It is by this name that an NDML programmer references data.

Database Management System: (DBMS)

Distributed Request Supervisor: (DRS) This IISS CDM subsystem configuration item controls the execution of distributed NDML queries and non distributed updates.

Domain: A logical definition of legal attribute class values.

**Domain Constraint:** Predicate that applies to a single domain.

**External Schema:** (ES)

**Forms:** Structured views which may be imposed on windows or other forms. A form is composed of fields where each field is a form, item, or window.

**Forms Processor:** (FP) A set of callable execution time routines available to an application program for form processing.

**Internal Schema:** (IS)

**Integrated Information Support System:** (IISS) A test computing environment used to investigate, demonstrate and test the concepts of information management and information integration in the context of Aerospace Manufacturing. The IISS addresses the problems of integration of data resident on heterogeneous databases supported by heterogeneous computers interconnected via a local Area Network.

**Mapping:** The correspondence of independent objects in two schemas: ES to CS or CS to IS.

**Network Transaction Manager:** (NTM) Performs the coordination, communication and housekeeping functions required to integrate the application processes and system services resident on the various hosts into a cohesive system.

**Neutral Data Manipulation Language:** (NDML) A language developed by the IISS project to provide uniform access to common data, regardless of database manager or distribution criteria. It provides distributed retrieved and single node updates.

**ORACLE:** Relational DBMS based on the SQL (Structured Query Language, a product of ORACLE Corp, Menlo Park, CA). The CDM is an ORACLE database.

**Parcel:** A sequential file containing sections of source code of the input Application.

**Request Processor:** (RP) A COBOL program that will satisfy a retrieval or update NDML subtransaction against a particular Database Management System.

**User Interface:** (UI) Controls the user's terminal and interfaces with the rest of the system.

**Virtual Terminal Interface:** (VTI) Performs the interfacing between different terminals and the UI. This is done by defining a specific set of terminal features and protocols which must be supported by UI software which constitutes the Virtual Terminal Definition. Specific terminals are then mapped against the Virtual Terminal software by specific software modules written for each type of real terminal supported.



### SECTION 3

#### REQUIREMENTS

#### 3.1 Structural Description

The graphic portrayal of this CPCI is included in Section 3.10. This chart shows the hierarchical relationship of each module making up this CPCI.

This CPCI uses a lower level module to handle specific operations. Generating the external schema record definition based on the attributes resident in the External Schema Action List (CDP8A) is an example of this type of operation.

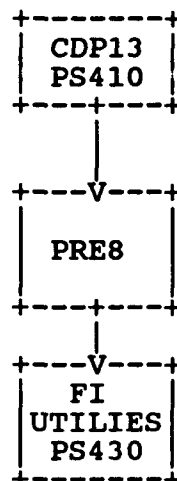
#### 3.2 Functional Flow

This CPCI implemented the logic defined in the Development Specification for this CPCI. Details of inputs/outputs and relationships between modules are found in Section 3.10.

This CPCI has been designated to operate in a batch or interactive mode. It must operate in the system environment established for IISS; that is, the Network Transaction Manager. It currently can only be executed on the DEC VAX due to the dependence on the VAX sort although this can be changed for execution on the IBM.

#### 3.3 Interfaces

The following depicts the interface of PRE8 with other CPCI's in the system.



### 3.3.1 Inputs/Outputs

The following depicts the inputs and outputs of this CPCI. A detail description for each item can be found in the DS for this CPCI.

FUNCTION: PRE8

<u>INPUT</u>	<u>OUTPUT</u>
Target-Host	Generated File Name
Current-Host	Module Status
Module-Name	
External Schema Action List	
Conceptual Schema Action List	
Error File	
Boolean List	
Conceptual Schema Quality List	
Internal Schema Quality List	
Complex Mapping Flag	

### 3.4 Program Interrupts

Not applicable to the CPCI.

### 3.5 Timing and Sequencing Description

This CPCI is called for each NDML Query statement to transform the results from conceptual to external.

### 3.6 Special Control Features

Not applicable to this CPCI.

### 3.7 Storage Allocation

#### 3.7.1 Database Definition

The database used by this CPCI is the Common Data Model (CDM) database. The model is defined by the CDM1, the IDEF-1 Model of the CDM, Reference Number 3.

##### 3.7.1.1 File Description

No permanent files have been defined for this CPCI. It may use temporary scratch files for such things as input and results.

##### 3.7.1.2 Table Description

All tables used by this CPCI have been defined by the Development Specification for this CPCI.

##### 3.7.1.3 Item Description

Not applicable to this CPCI.

### 3.8 Object Code Creation

The Object Code for this CPCI will be created by the system integration team using defined IISS Software Configuration Management procedures. This CPCI will use the COBOL, FORTRAN, and C language compilers.

### 3.9 Adaptation Data

This CPCI has been coded using ANSI COBOL language. The intent was to provide a transportable system. Any system environment supporting this language, a virtual memory management schema, the COMM and NTM subsystems of IISS and the ORACLE Database Management System should be able to support this CPCI. Every possible attempt has been to localizing and identifying any machine or environment dependent modules through the original design of the IISS and application of Configuration Management Procedures.

### 3.10 Detail Design Description

The following sections have been computer generated for this CPCI.

### 3.10.1 Where Include File Used List

The following lists each include file in the documentation group and all the modules documented in this specification which include them. The purpose of each module is listed as well.

#### DOCGROUP PS41253 Where-include-file-used List

Include File -----	Module Name -----
ERRCDM	CDCE CDP8A CDPRE8 CDPRE8C CDPRE8D
ERRFS	CDCE CDPRE8 CDPRE8C CDPRE8D
MACDAT	CDCE CDPRE8 CDPRE8C CDPRE8D
SBSTLST	CDCE CDPRE8 CDPRE8C CDPRE8D
EOD	CDCE
CSAL	CDCE CDP8A CDPRE8 CDPRE8C CDPRE8D
ESAL	CDCE

DOCGROUP PS41253 Where-include-file-used List

Include File -----	Module Name -----
	CDP8A
	CDPRE8
	CDPRE8C
ERRPRO	
	CDCE
	CDP8A
	CDPRE8
	CDPRE8C
	CDPRE8D
ESREC	
	CDP8A
	CDPRE8
CHKCDM	
	CDPRE8
FORVAR	
	CDPRE8
	CDPRE8C
	CDPRE8D
BOOLST	
	CDPRE8
	CDPRE8C
	CDPRE8D
CSQUAL	
	CDPRE8
	CDPRE8C
	CDPRE8D
ISQUAL	
	CDPRE8
	CDPRE8C
	CDPRE8D

### 3.10.2 Where External Routine Used List

The following lists each external function or routine in the documentation group and all the documented modules which call it. The purpose of each module is listed as well.

#### DOCGROUP PS41253 Where-external-routine-used List

System Module -----	Module Name -----
ERRPRO	CDCE
	CDP8A
	CDPRE8
	CDPRE8C
	CDPRE8D
SQLSCA	CDCE
SQLBS1	CDCE
SQLSCH	CDCE
SQLSCC	CDCE
SQLTOC	CDCE
SQLLOSQ	CDCE
SQLADR	CDCE
SQLAB1	CDCE
SQLLEX	CDCE
SQLCLS	CDCE
SQLAD1	CDCE
SQLFCH	CDCE
SQLTFL	

DOCGROUP PS41253 Where-external-routine-used List

System Module -----	Module Name -----
	CDCE
SQLOPN	CDCE
CDPIC	CDCE CDP8A CDPRE8C CDPRE8D
CDMACR	CDCE CDPRE8 CDPRE8C CDPRE8D
OUTFIL	CDCE CDP8A CDPRE8 CDPRE8C CDPRE8D
CDCWF	CDPRE8 CDPRE8C CDPRE8D
CLSFIL	CDPRE8 CDPRE8C CDPRE8D
GENFIL	CDPRE8 CDPRE8C CDPRE8D

DOCGROUP PS41253 Where-external-routine-used List

System Module -----	Module Name -----
OPNFIL	CDPRE8 CDPRE8C CDPRE8D
CDPIC8	CDPRE8
CDGENIF	CDPRE8 CDPRE8C CDPRE8D



### 3.10.3 Main Program Parts List

The following lists each Main Program in the documentation group and all the modules which are called either by that module itself or by any of the documented modules which it calls. It is possible for a non-main module to be listed more than once if it is called by multiple modules. The called modules, in this case known as program parts, are marked as to whether they are documented here. If so, the phrase "well-defined module" appears by the module name, if not it is an "external routine". The Purpose of the Main Program module is listed as well.

#### DOCGROUP PS41253 Main Program Parts List

Main Pgm Name -----	Module Name -----	Module Type -----
CDCE	ERRPRO	External routine
	SQLSCA	External routine
	SQLBS1	External routine
	SQLSCH	External routine
	SQLSCC	External routine
	SQLTOC	External routine
	SQLOSQ	External routine
	SQLADR	External routine
	SQLAB1	External routine
	SQLXEX	External routine
	SQLCLS	External routine
	SQLAD1	External routine
	SQLFCH	External routine
	SQLTFL	External routine
	SQLOPN	External routine
	CDPIC	External routine
	CDMACR	External routine
	OUTFIL	External routine
CDP8A	ERRPRO	External routine
	CDPIC	External routine
	OUTFIL	External routine
CDPRE8	ERRPRO	External routine
	CDMACR	External routine
	OUTFIL	External routine
	CDCWF	External routine
	CLSFIL	External routine
	GENFIL	External routine
	OPNFIL	External routine

DOCGROUP PS41253 Main Program Parts List

Main Pgm Name -----	Module Name -----	Module Type -----
	CDP8A	External routine
	CDPIC8	External routine
	CDCE	External routine
	CDGENIF	External routine
CDPRE8C		
	ERRPRO	External routine
	CDPIC	External routine
	CDMACR	External routine
	OUTFIL	External routine
	CDCWF	External routine
	CLSFIL	External routine
	GENFIL	External routine
	OPNFIL	External routine
	CDGENIF	External routine
CDPRE8D		
	ERRPRO	External routine
	CDPIC	External routine
	CDMACR	External routine
	OUTFIL	External routine
	CDCWF	External routine
	CLSFIL	External routine
	GENFIL	External routine
	OPNFIL	External routine
	CDGENIF	External routine

### 3.10.4 Module Documentation

The following documentation describes information which is specific to each individual module in the documentation group being documented in this specification. It provides a compact way of getting information that would be otherwise buried within each module's source code.

The specific items in this module documentation have the following meanings:

NAME:	Name of program Module.
PURPOSE:	Purpose of Module as detailed in the source code.
LANGUAGE:	Programming language source code is written in. The choices are: VAX-11 FORTRAN C (I/S-1 Workbench 'C') VAX-11 COBOL
MODULE TYPE:	Whether a Program, Subroutine, or Function.
SOURCE FILE:	Name of Source File from file specification.
SOURCE FILE TYPE:	Source File Extension from file specification.
HOST:	Whether this is a host-dependent routine (VAX or IBM) or blank if host-independent.
SUBSYSTEM:	IISS sub-system this file resides in.
SUBDIRECTORY:	Sub-directory of that subsystem in which this file resides.
DOCUMENTATION GROUP:	Name of documentation group of which this source file is a member.
DESCRIPTION:	A description of the module as obtained from the source code.
ARGUMENTS:	The arguments with which this routine is called if it is a Subroutine or a Function.
INCLUDE FILES:	A list of all the files that are included into this module as well as their purposes.
ROUTINES CALLED:	Subroutines or Functions, either documented or external, called by this module, if any.

**CALLED DIRECTLY BY:** The documented routines which call this module, if any.

**USED IN MAIN PROGRAM(S):** The documented Main Programs which contain this module in their parts list according to the list in section 3.10.3.

The Module Documentation is arranged alphabetically according to Module Name.

DOCGROUP PS41253 Module Documentation

NAME: CDCE  
PURPOSE: GENERATE CALLS TO COMPLEX MAPPING ALGORITHMS  
LANGUAGE: VAX-11 COBOL  
SOURCE FILE: CDCE  
SOURCE FILE TYPE: PCO  
HOST:  
SUBSYSTEM: CDM  
SUBDIRECTORY: NDML

DESCRIPTION:  
-----

PERFORM SQL SELECT TO RETURN USER DEFINED COMPLEX MAPPING  
ALGORITHM PARAMETERS AND THE PARAMETERS' TYPE, SIZE, NUMBER  
OF DECIMALS TO GENERATE THE INTERFACE AND CALLS TO USER  
DEFINED COMPLEX MAPPING ALGORITHMS.  
Modified 12/89 by FWK to generate macro CDCEF04G for a  
function

ARGUMENTS:  
-----

FCB-1	DSPLY[S9(9)]
FCB-2	DSPLY[S9(9)]
FCB-FIRST	DSPLY[S9(9)]
STRAIGHT-MOVE-FLAG	DSPLY[X(1)]
CS-ACTION-LIST	RECRD
ES-ACTION-LIST	RECRD
TARGET-HOST	DSPLY[X(3)]
CMA-FLAG	DSPLY[9]
SOURCE-LANGUAGE	DSPLY[X(10)]
BEGIN-END-POSITION-TABLE	RECRD
RET-STATUS	DSPLY[X(5)]

INCLUDE FILES:

-----  
ERRCDM  
ERRFS  
MACDAT  
SBSTLST  
EOD  
CSAL  
ESAL  
ERRPRO

ROUTINES CALLED:

-----  
ERRPRO  
SQLSCA  
SQLBS1  
SQLSCH  
SQLSCC  
SQLTOC  
SQLOSQ  
SQLADR  
SQLAB1  
SQLEXE  
SQLCLS  
SQLAD1  
SQLFCH  
SQLTFL  
SQLOPN  
CDPIC  
CDMACR  
OUTFIL

DOCGROUP PS41253 Module Documentation

NAME: CDP8A  
PURPOSE: GENERATE THE EXTERNAL SCHEMA RECORD DEFINITION  
LANGUAGE: VAX-11 COBOL  
SOURCE FILE: CDP8A  
SOURCE FILE TYPE: COB  
HOST:  
SUBSYSTEM: CDM  
SUBDIRECTORY: NDML

DESCRIPTION:

-----  
- THIS SUB PROGRAM WILL GENERATE THE  
EXTERNAL SCHEMA RECORD DESCRIPTION  
BASED ON ATTRIBUTES SET IN THE ES-ACTION-  
LIST. THE CS-ACTION-LIST IS USED FOR THE  
CS-NDML-NO (NNNNNN) IN THE ES VARIABLE  
WITH THE FORMAT ES-VAR-NNN-XX.  
-

ARGUMENTS:

-----  
CS-ACTION-LIST                      RECRD  
ES-ACTION-LIST                      RECRD  
FCB-F                                DSPLY[S9(9)]  
SOURCE-LANGUAGE                      DSPLY[X(10)]  
RET-STATUS                           DSPLY[X(5)]

INCLUDE FILES:

-----  
ESREC  
ERRCDM  
CSAL

PS 620341253  
30 September 1990

ESAL  
ERRPRO

ROUTINES CALLED:

-----  
CDPIC  
OUTFIL  
ERRPRO



DOCGROUP PS41253 Module Documentation

NAME: CDPRES  
PURPOSE: GENERATE CS/ES TRANSFORM PROGRAM  
LANGUAGE: VAX-11 COBOL  
SOURCE FILE: CDPRES  
SOURCE FILE TYPE: COB  
HOST:  
SUBSYSTEM: CDM  
SUBDIRECTORY: NDML

DESCRIPTION:

-----  
THIS FUNCTION GENERATES SOURCE CODE WHICH,  
AT RUN-TIME, WILL TRANSFORM THE AGGREGATED  
CONCEPTUAL RESPONSE FROM THE AGGREGATOR CI  
TO THE REQUIRED EXTERNAL RESPONSE.

UPDATED 2/6: ADDED PARAMETER 'FCB-1' TO CALL TO CDCE.  
UPDATED 3/13/89: CHANGED ALL CALLS TO CDPIC TO CDPIC8;  
GENERATE 'SIGN LEADING SEPARATE' CLAUSE  
FOR CS-VARS AND WS-ES-VARS.

ARGUMENTS:

-----  
TARGET-HOST                   DSPLY[XXX]  
MY-HOST                       DSPLY[XXX]  
MOD-NAME                      DSPLY[X(10)]  
ES-ACTION-LIST                RECRD  
CS-ACTION-LIST                RECRD  
BOOLEAN-LIST                  RECRD  
CS-QUALIFY-LIST               RECRD  
IS-QUALIFY-LIST               RECRD  
FCB-E                         DSPLY[S9(9)]  
CMA-FLAG                      DSPLY[9]

GEN-FILE-NAME  
SOURCE-LANGUAGE  
RET-STATUS

DSPLY[X(80)]  
DSPLY[X(10)]  
DSPLY[X(5)]

INCLUDE FILES:

-----

ESREC  
MACDAT  
SBSTLST  
ERRCDM  
ERRFS  
CHKCDM  
FORVAR  
CSAL  
ESAL  
BOOLST  
CSQUAL  
ISQUAL  
ERRPRO

ROUTINES CALLED:

-----

CDCWF  
CLSFIL  
GENFIL  
OPNFIL  
ERRPRO  
CDP8A  
CDPIC8  
CDCE  
CDGENIF  
CDMACR  
OUTFIL

DOCGROUP PS41253 Module Documentation

NAME: CDPRE8C  
PURPOSE: CS SELECTOR PROGRAM FOR COMPOUND SELECT STATEMENTS  
LANGUAGE: VAX-11 COBOL  
SOURCE FILE: CDPRE8C  
SOURCE FILE TYPE: COB  
HOST:  
SUBSYSTEM: CDM  
SUBDIRECTORY: NDML

DESCRIPTION:

-----  
- GENERATE COBOL SOURCE CODE WHICH AT RUNTIME  
PERFORMS THE FINAL QUALIFICATION ON CONCEPAL  
ROWS, A FILE AT A TIME, FOR THE INNFR SELECT  
STATEMENTS OF A COMPOUND SELECT STATEMENT.

THERE ARE NO CS-ES TRANSFORMS PERFORMED  
BY THE CS-ES SELECTOR.

8/8/89: UPDATED TO GENERATE C CODE. FORTRAN GENERATION  
WAS COMPLETED IN DECEMBER OF '88.

ARGUMENTS:

-----  
TARGET-HOST                   DSPLY[XXX]  
MY-HOST                       DSPLY[XXX]  
MOD-NAME                      DSPLY[X(10)]  
CS-ACTION-LIST                RECRD  
CS-QUALIFY-LIST               RECRD  
BOOLEAN-LIST                  RECRD  
IS-QUALIFY-LIST               RECRD  
ES-ACTION-LIST                RECRD  
SOURCE-LANGUAGE               DSPLY[X(10)]

GEN-FILE-NAME  
RET-STATUS

DSPLY[X(80)]  
DSPLY[X(5)]

INCLUDE FILES:

-----  
MACDAT  
SBSTLST  
ERRCDM  
ERRFS  
FORVAR  
CSAL  
CSQUAL  
BOOLST  
ISQUAL  
ESAL  
ERRPRO

ROUTINES CALLED:

-----  
GENFIL  
OPNFIL  
CLSFIL  
CDCWF  
ERRPRO  
CDPIC  
CDGENIF  
CDMACR  
OUTFIL

DOCGROUP PS41253 Module Documentation

NAME: CDPRE8D  
PURPOSE: REFERENTIAL INTEGRITY TEST AND KEY UNIQUENESS PROGRAM  
LANGUAGE: VAX-11 COBOL  
SOURCE FILE: CDPRE8D  
SOURCE FILE TYPE: COB  
HOST:  
SUBSYSTEM: CDM  
SUBDIRECTORY: NDML

DESCRIPTION:

-----  
- GENERATE COBOL SOURCE CODE WHICH AT RUNTIME  
PERFORMS THE FINAL QUALIFICATION ON TYPE 1  
AND TYPE2 REFERENTIAL INTEGRITY TESTS AND KEY  
UNIQUENESS TESTS.  
-

ARGUMENTS:

-----  
TARGET-HOST                   DSPLY[XXX]  
MY-HOST                       DSPLY[XXX]  
MOD-NAME                      DSPLY[X(10)]  
CS-ACTION-LIST                RECRD  
CS-QUALIFY-LIST               RECRD  
BOOLEAN-LIST                  RECRD  
IS-QUALIFY-LIST               RECRD  
SOURCE-LANGUAGE               DSPLY[X(10)]  
GEN-FILE-NAME                 DSPLY[X(80)]  
RET-STATUS                    DSPLY[X(5)]

INCLUDE FILES:

-----

MACDAT  
SBSTLST  
ERRCDM  
ERRFS  
FORVAR  
CSAL  
CSQUAL  
BOOLST  
ISQUAL  
ERRPRO

ROUTINES CALLED:

-----

GENFIL  
OPNFIL  
CLSFIL  
CDCWF  
ERRPRO  
CDPIC  
CDGENIF  
CDMACR  
OUTFIL

### 3.10.5 Include File Descriptions

The following list contains a purpose and description of each include file in the documentation group as specified in the source code. The language it is written in is also given.

#### DOCGROUP PS41253 Include File Description

FILE NAME: BOOLST  
PURPOSE: BOOLEAN LIST  
LANGUAGE: VAX-11 COBOL

#### DESCRIPTION: -----

#### DOCGROUP PS41253 Include File Description

FILE NAME: CHKCDM  
PURPOSE: IISS CDMF CHECK STATUS CODES  
LANGUAGE: VAX-11 COBOL

#### DESCRIPTION: -----

CONTAINS ALL STATUS CODES FOR THE \*  
CDMP MODULES \*

#### DOCGROUP PS41253 Include File Description

FILE NAME: CSAL  
PURPOSE: CONCEPTUAL SCHEMA ACTION LIST  
LANGUAGE: VAX-11 COBOL

#### DESCRIPTION: -----

#### TABLE TO HOLD CONCEPTUAL DATA ABOUT THE REQUEST

NOTE!!!!!! This table is cloned in both cdpre5 and cdpre4  
so any changes made to this structure needs to  
be made in these cloned versions. Clone version  
is CSALX for CDPRE4.

NOTE AGAIN Any changes to the CS-ACTION-ENTRY must be  
reflected in CDP10B in the C code generation section. The  
length of CS-STRING2 has been hard coded in the  
generated C code in paragraph

210-GEN-MOVE-OF-TABLES.

\*\*\*\*\* THE CONCEPTUAL SCHEMA ACTION LIST

DOCGROUP PS41253 Include File Description

FILE NAME: CSQUAL  
PURPOSE: CONCEPTUAL SCHEMA QUALIFY LIST  
LANGUAGE: VAX-11 COBOL

DESCRIPTION:  
-----

CONTAINS CONCEPTUAL SCHEMA INFORMATION FOR  
THE REQUEST'S QUALIFICATION

NOTE!!!!

This table is cloned as CSQUALX in CDPRE4. If it  
is changed, CSQUALX must be changed also.

THE CONCEPTUAL SCHEMA QUALIFY LIST

DOCGROUP PS41253 Include File Description

FILE NAME: EOD  
PURPOSE: SQL END OF DATA DEFINITION  
LANGUAGE: VAX-11 COBOL

DESCRIPTION:  
-----

DOCGROUP PS41253 Include File Description

FILE NAME: ERRCDM  
PURPOSE: IISS ERROR STATUS CODES FOR CDMP MODULES  
LANGUAGE: VAX-11 COBOL

DESCRIPTION:  
-----

CONTAINS ALL ERROR CODES USED BY CDMP  
MODULES FOR ERROR HANDLING

\*  
\*



DOCGROUP PS41253 Include File Description

FILE NAME: ERRFS  
PURPOSE: ERRFS.INC - FILE I/O PRIMITIVES (FILE SERVICES)  
LANGUAGE: VAX-11 COBOL

DESCRIPTION:  
-----

IISS ERROR CODES

THIS FILE DEFINES THE FS STATUS  
CODES IN COBOL FORMAT

DOCGROUP PS41253 Include File Description

FILE NAME: ERRPRO  
PURPOSE: PROCESS ERROR INCLUDE FILE  
LANGUAGE: VAX-11 COBOL

DESCRIPTION:  
-----

DOCGROUP PS41253 Include File Description

FILE NAME: ESAL  
PURPOSE: EXTERNAL SCHEMA ACTION LIST  
LANGUAGE: VAX-11 COBOL

DESCRIPTION:  
-----

CONTAINS THE EXTERNAL SCHEMA INFORMATION FOR AN  
NDML REQUEST

THE EXTERNAL SCHEMA ACTION LIST

DOCGROUP PS41253 Include File Description

FILE NAME: ESREC  
PURPOSE: WS DEFINITION FOR COBOL SOURCE LINE  
LANGUAGE: VAX-11 COBOL

DESCRIPTION:  
-----

THIS DEFINITION IS USED WHEN GENERATING COBOL  
SOURCE CODE

CHANGED FOR AAAP PROJECT TO REFLECT FORTRAN AND  
C SOURCE CODE FORMATS. JULY 22, 1988

DOCGROUP PS41253 Include File Description

FILE NAME: FORVAR  
PURPOSE: FORTRAN VARIABLE TABLE  
LANGUAGE: VAX-11 COBOL

DESCRIPTION:  
-----

THIS TABLE HOLDS THE ORIGINAL FORTRAN VARIABLE  
AND ITS GENERATED SIX-CHARACTER COUNTERPART.

DOCGROUP PS41253 Include File Description

FILE NAME: ISQUAL  
PURPOSE: INTERNAL SCHEMA QUALIFY LIST  
LANGUAGE: VAX-11 COBOL

DESCRIPTION:  
-----

CONTAINS INTERNAL SCHEMA INFORMATION FOR AN  
NDML QUALIFICATION

THE INTERNAL SCHEMA QUALIFY LIST

DOCGROUP PS41253 Include File Description

FILE NAME: MACDAT  
PURPOSE: WS VARIABLES FOR MACRO COPY UTILITY  
LANGUAGE: VAX-11 COBOL

DESCRIPTION:  
-----

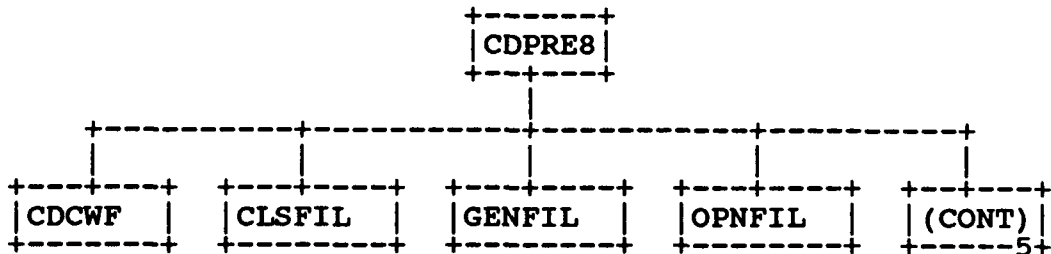
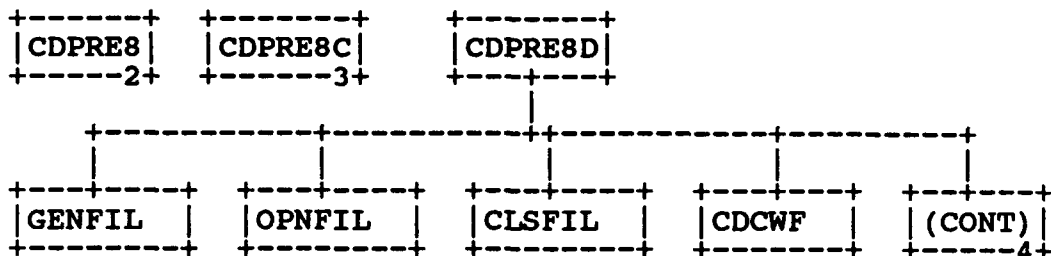
DOCGROUP PS41253 Include File Description

FILE NAME: SBSTLST  
PURPOSE: WS DEFINITION FOR THE SUBSTITUTION LIST TABLE  
LANGUAGE: VAX-11 COBOL

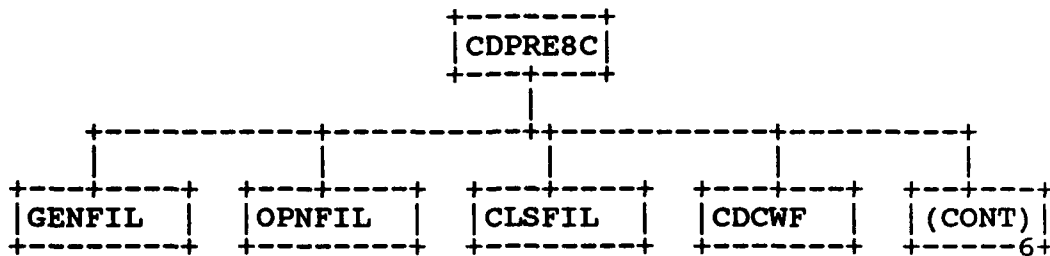
DESCRIPTION:  
-----

SUBSTITUTION-LIST REPRESENTS THE INPUT TABLE  
OF SUBSTITUTION PARAMETERS FOR THE CDMACR  
MACRO EXPANSION SUBROUTINE

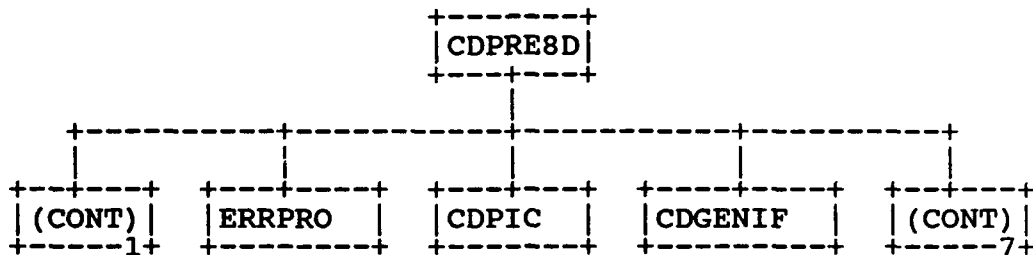
3.10.6 Hierarchy Charts



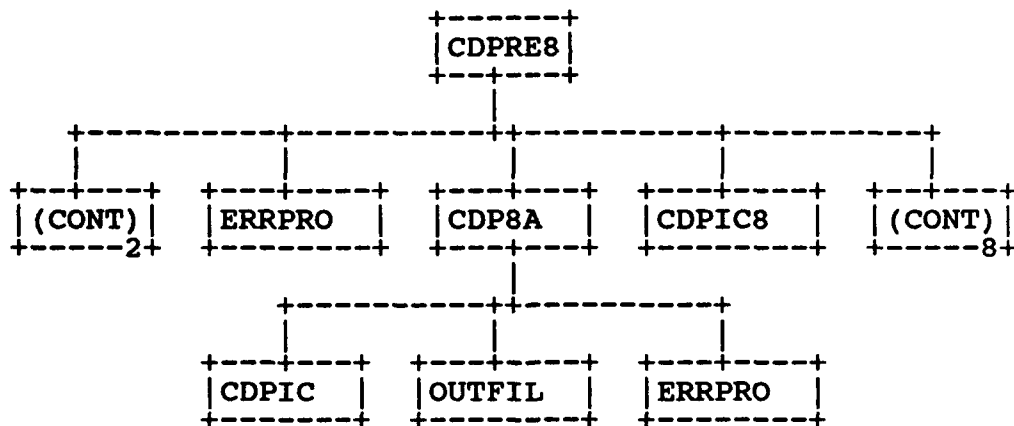
3



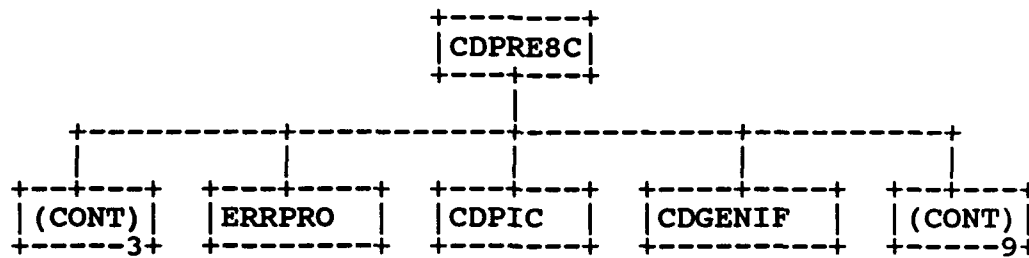
4



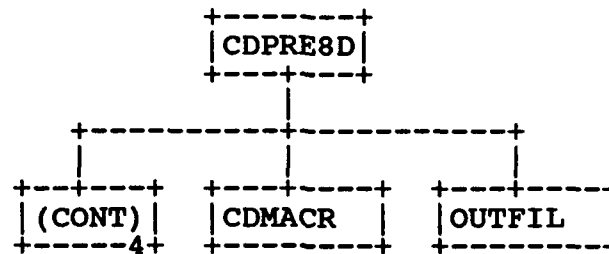
5



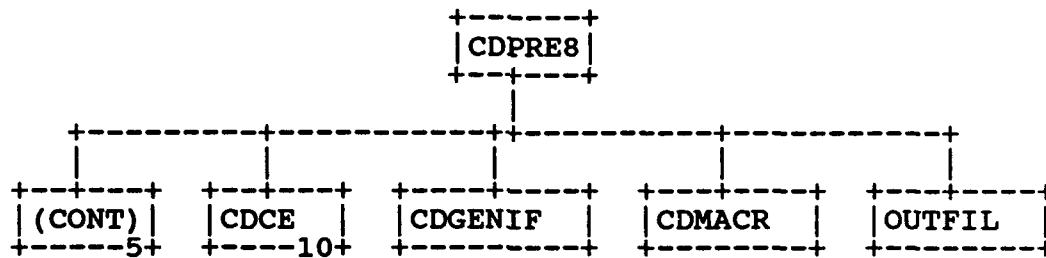
6



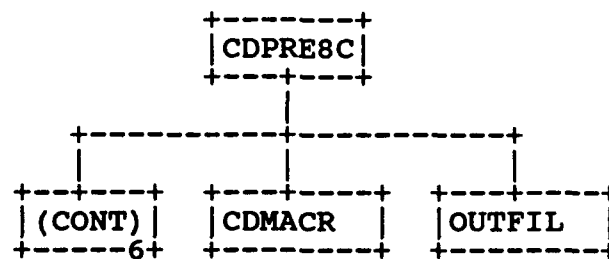
7



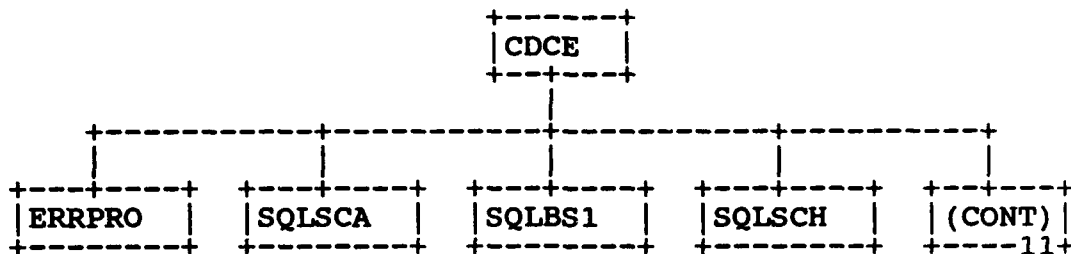
8



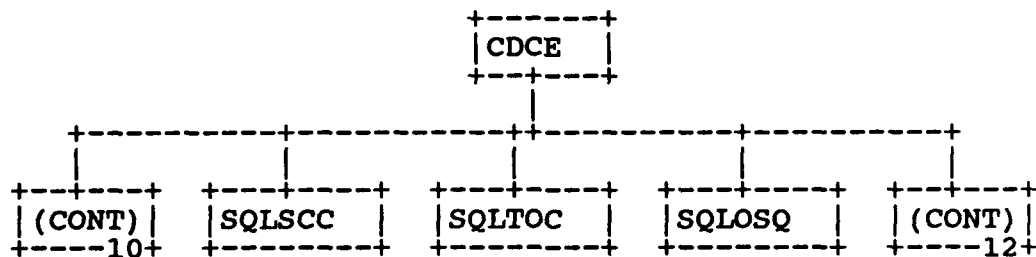
9



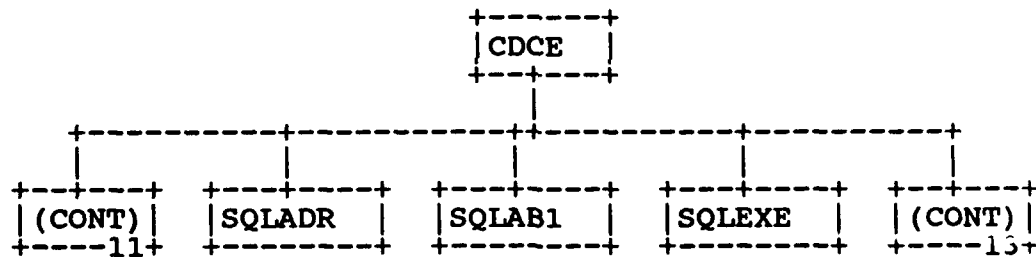
10



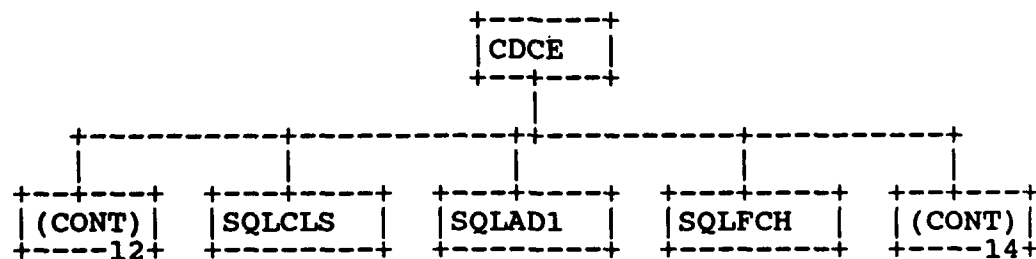
11



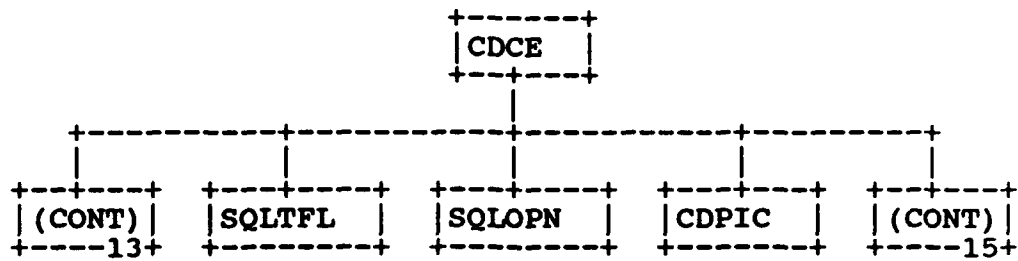
12



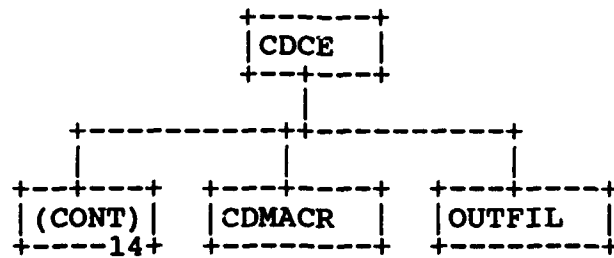
13



14



15



CDCE .....10  
CDCWF  
CDGENIF  
CDMACR  
CDP8A .....5  
CDPIC  
CDPIC8  
CDPRE8.....2  
CDPRE8C.....3  
CDPRE8D.....1  
CLSFIL  
ERRPRO  
GENFIL  
OPNFIL  
OUTFIL  
SQLAB1  
SQLAD1  
SQLADR  
SQLBS1  
SQLCLS  
SQLEXE  
SQLFCH  
SQLOPN  
SQLOSQ  
SQLSCA  
SQLSCC  
SQLSCH  
SQLTFL  
SQLTOC



3.11 Program Listings Comments

This information is contained in the Module Descriptions in section 3.10.

## SECTION 4

### QUALITY ASSURANCE PROVISIONS

#### 4.1 Introduction and Definitions

"Testing" is a systematic process that may be preplanned and explicitly stated. Test techniques and procedures may be defined in advance, and a sequence of test steps may be specified. "Debugging" is the process of isolation and correction of the cause of an error.

"Antibugging" is defined as the philosophy of writing programs in such a way as to make bugs less likely to occur and when they do occur, to make them more noticeable to the programmer and the user. In other words, as much error checking as is practical and possible in each routine should be performed.

#### 4.2 Computer Programming Test and Evaluation

The quality assurance provisions for test consists of the normal testing techniques that are accomplished during the construction process. They consist of design and code walk-throughs, unit testing, and integration testing. These tests are performed by the design team. Structured design, design walk-through and the incorporation of "antibugging" facilitate this testing by exposing and addressing problem areas before they become coded "bugs."